

The meta question is simply this: where should the network's intelligence and regulations be located: In the center or at the edges? Can we create a cognitive radio in which both intelligence and regulatory controls exist in such a manner as to create a trusted agent?

...if you wish to maintain your liberty, you must ensure that you live under a political system in which there is no element of discretionary power, and hence no possibility that your civil rights will be dependent on the goodwill of a ruler, a ruling group, or any other agent of the state... [see Galbi's paper for a fuller quote]

To the extent we allow the imposition of intermediaries in the center which have remote and arbitrary discretionary power over our choices and actions at the end points, to that extent we are not free. Thus this becomes a very important political argument that transcends market or technology only considerations and requires a "systems" approach.

The original argument of American democracy in the 18th century posited a great deal of faith in trusted end points - the yeoman gentry. The Founders had, from direct experience, a strong suspicion of central and remote authority as represented by the Crown and its corporate agent the East India Company. Hence the argument and tensions between the original Federalists and the Jeffersonian camp. In this respect, there is a strong link here in 2002 to certain Libertarian views.

As for the End-to-End argument, Gerry wrote: I am less than theological about this; I would suggest reading the Dave Clark/Marjorie Blumenthal piece "Rethinking the Design of the Internet: The End-to-end Arguments vs. the Brave New World". And it is not at all obvious this is the optimal design for wireless markets."

I recommend IP members read the original:

< http://ana.lcs.mit.edu/anaweb/PDF/Rethinking_2001.pdf >

Rethinking the design of the Internet:

The end to end arguments vs. the brave new world****

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Abstract

This paper looks at the Internet and the changing set of requirements for the Internet that are emerging as it becomes more commercial, more oriented towards the consumer, and used for a wider set of purposes. **We discuss a set of principles that have guided the design of the Internet, called the end to end arguments, and we conclude that there is a risk that the range of new requirements now emerging could have the consequence of compromising the Internet's original design principles.** Were this to happen, the Internet might lose some of its key features, in particular its ability to support new and unanticipated applications. We link this possible outcome to a number of trends: the rise of new stakeholders in the Internet, in particular Internet Service Providers; new government interests; the changing motivations of the growing user base; and the tension between the demand for trustworthy overall operation and the inability to trust the behavior of individual users.

Introduction

The end to end arguments are a set of design principles that characterize (among other things) how the Internet has been designed. These principles were first articulated in the early 1980s,² and they have served as an architectural model in countless design debates for almost 20 years. The end to end arguments concern how application requirements should be met in a system. When a general purpose system (for example, a network or an operating system) is built, and specific applications are then built using this

system (for example, e-mail or the World Wide Web over the Internet), there is a question of how these specific applications and their required supporting services should be designed. **The end to end arguments suggest that specific application-level functions usually cannot, and preferably should not, be built into the lower levels of the system—the core of the network. The reason why was stated as follows in the original paper:**

The function in question can completely and correctly be implemented only with the knowledge and help of the application standing at the endpoints of the communications system.

Therefore, providing that questioned function as a feature of the communications systems itself is not possible.

[emphasis added]

The conclusion of this paper supports the End-to-End argument even more strongly.

Auctions would appear to lock us into not only a false property model but also the co-location of the networks "smarts" and regulation in the center where it is least robust, most vulnerable to terrorist attack, and creates the greatest obstacles to future innovation and economic activity. Auctions, in other words, would appear to run counter to the end-to-end argument.

I am indebted to others for pointing out the Faulhaber mis-understands the message in the Blumenthal & Clark paper. I hope the authors themselves might speak to this issue.

Douglas Galbi writes about his paper [Revolutionary Ideas for Radio Regulation](http://www.galbithink.org) <
<http://www.galbithink.org> >

"On property rights to "spectrum," I think that's a bad way to frame the issue. Thus I focus on radio use, not spectrum use, and radio rights, not spectrum rights. You might notice that I essentially never use the word "spectrum" in my paper. I don't think that connecting radio rights to abstract notions of property rights is helpful. My paper does not advocate "property rights to spectrum," and it doesn't attack that idea either.

Other issues seem to me more important. In particular, it seems to me that the FCC should focus less on preventing interference among radio signals and more on increasing communications capabilities with radio. Intentional radio use should be subject to less restrictive regulation than unintentional or incidental radio use. The former should be regulated like persons walking and talking, the latter should be regulated like pollution."

Galbi raises the critical point that property rights, the essence of the auction argument, may well be sub optimal, if not inappropriate. Would it be better to study the law of the sea, which basically treats the ocean as a commons, for guidance on maximizing communications capacity?

The deregulation of airlines, which Gerry mentioned, is an interesting case. Today we have fewer carriers almost all of whom are in worse financial shape, offering fewer routes with less services at higher fares and most of whom are seeking Federal bailouts. What is wrong with this privatized and deregulated picture? Is this the result we seek for maximizing communications capacity while delivering greatest benefits to the greatest number of users at least costs per user? I don't think so. Economic dogma leads to strange unintended consequences.

We have to get at the root of the idea: Is this about capacity or property? Are we believers in the in the edges or the center? Are we seeking a regulatory regime of choice and options or one of obligations and coercion? If the property model will not serve the greatest number of users with the greatest benefits at least cost, I think we need to seriously rethink the sale of spectrum. Frankly, I see the sale of spectrum as a political instrument of the New Federalist Agenda of the very most conservative sector of our political spectrum -- as it were.

Lastly, Gerry appears to miss the point about end user capital as the strongest financing model for the next wave of innovative technologies. He appears to be locked into large scale financing from central sources: VCs and banks -- "The Financial Markets". But what if this is wrong, as we see in the case of the cell phone industry today? This point was forcefully made by a recovering cell phone executive who is now at Microsoft.

What we need in this country, I believe, is a Spectrum Commons -- a radio haven -- which has an options path that will enable it to start small and grow as we exercise the options, based upon success, to assign ever more capacity to the commons.

We need to understand and further the idea of networks that are

- a) Largely user-financed,
- b) Undifferentiating between producer and consumer,
- c) Architected so that "cooperation gain" creates most of the value.

We need a significant test bed for cognitive radios.

In the end, have we become so blinded by the monotonic mantra of the all trumping virtues of the market that we have lost site of the basic facts of natural human rights and freedom? We, and the French, fought revolutions in the 18th century to claim these natural rights and freedoms for human beings [natural persons]. We would do well to revisit the results of this flash of brilliant political discovery.

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Shall we have a human rights based communications paradigm or shall we have a property rights regime, the unintended consequence of early 20th century technology and knowledge?